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# Marshall Star

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## Second DC-XA Flight Planned for Friday; Third Flight Could Follow on Same Day

The second in a series of five test flights planned for NASA's Delta Clipper-Experimental Advanced (DC-XA) single stage rocket is scheduled for 9 a.m. CDT on Friday at the White Sands Missile Range in New Mexico.

The DC-XA, developed by McDonnell Douglas Aerospace and NASA under a cooperative agreement as part of the Reusable Launch Vehicle Technology Program, successfully completed its first test flight on May 18. The vehicle's advanced technology components, including a composite liquid hydrogen tank and aluminum lithium liquid oxygen tank, all performed well. The purpose of the DC-XA flight tests is to demonstrate the performance of these technologies, which are required for the development of a single-stage-to-orbit reusable launch vehicle.

"We're very pleased with the performance of the DC-XA to date and look forward to gaining more knowledge about advanced propulsion technologies in its second flight," said Dan Dumbacher, DC-XA program manager at the Marshall Center.

Dumbacher said that if conditions permit, a third flight of the DC-XA may be attempted, possibly as early as eight hours after completion of the second flight in the test series. A decision to attempt that additional flight will be made about four hours after completion of the scheduled test flight.

"If everything falls in place, we'll fly twice in the same day, but we're not going to take any unnecessary risks with the vehicle,"\* said

Dumbacher. Conducting the additional test would demonstrate the vehicle's reusability, and also would reduce the overall cost of the test series by obtaining a **second** set of test objectives **for** a small incremental cost, he said.

A 62-second flight is planned, during which the DC-XA will rise to an altitude of 1,950 feet and travel 500 feet up range, before landing on a surface of compacted gypsum. This landing pad is 150 feet from the grated landing pad used for the vehicle's first test flight.

If an additional test is attempted, the DC-XA would fly for 125 seconds, reaching an altitude of 8,600 feet.

The U.S. Air Force's Phillips Laboratory at Kirtland Air Force Base, New Mexico, is managing flight test operations.

(See *DC-XA* on page 3)

## Griner, Ladner, Blair Honored With Presidential Rank Awards

Two current members and a former member of the Marshall Center's Senior Executive Service (SES) have been awarded the Presidential Rank of Distinguished Executive or Meritorius Executive by the White House.

Marshall Deputy Director Carolyn Griner was awarded the Presidential Rank of Distinguished Executive while Gerald Ladner, manager of the Space Shuttle Main Engine Office and James Blair, former director of the Structures and Dynamics Laboratory, were awarded the Presidential Rank of Meritorius Executive.

Griner and other recipients of the Distinguished Executive Rank were honored at a Washington banquet by the Senior Executives Association Professional Development League. Griner, along with Ladner and Blair, will be recognized by Marshall Director Dr. Wayne Little at the Center's annual honors awards ceremony on June 12.

Each year, the President rewards outstanding career SES members for sustained extraordinary accomplishments. The Distinguished Executive award is granted to only one percent and the Meritorius Executive award is granted to only five percent of SES members government wide.



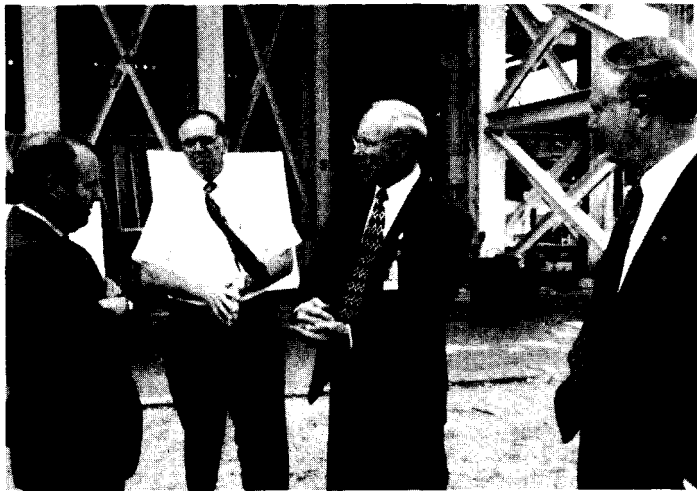
Carolyn Griner



Gerald Ladner



James Blair



Associate Deputy Administrator Visit- Marshall's External Tank Manager Parker Counts, (third from left), and Aluminum Lithium Test Article Manager David Snoddy brief Associate Deputy Administrator (Technical) Michael Mott (left) during his visit to Marshall last week. Center Director Dr. Wayne Little observes as Counts explains the subscale test of the super lightweight tank  
Photo by Dennis Kein

# Tethered Satellite Investigation Report Released

NASA and the Italian Space Agency (ASI) Tuesday released the report of the investigative board appointed to **determine factors** which resulted in the Feb. 25 tether break and loss of the Tethered Satellite **during the STS-75 Space Shuttle mission.**

Findings of the board, included in a 358-page document, identified primary causes which accounted for the tether break during deployment of the Tethered Satellite.

"The tether failed as a result of arcing and burning of the tether, leading to a tensile failure after a significant portion of the tether had burned away," the report **concludes.** The arcing occurred because either external foreign object penetration (but not orbital debris or micrometeoroids) or a defect in the tether caused a breach in the layer of insulation surrounding the tether conductor. The insulation breach provided a path for the current to jump, or arc, from the copper wire in the tether to a nearby electrical ground.

The board found that the arcing burned away most of the tether material at that location, leading to separation of the tether from tensile or pulling force. The break **occurred** when approximately 12.2 miles (19.7 km) of tether was unreeled, in a period when the tether was experiencing normal stresses of approximately 15 pounds (65 newtons).

In addition to the two primary causes for the tether break, the board cited, as one contributing factor, that "the degree of vulnerability of the tether insulation to damage was not fully appreciated." The board noted that the actual environment that the tether was exposed to in flight made it more vulnerable to damage than was expected. And, it noted that the high voltages under which the system was operating could, over a period of time, have reduced the ability of the tether insulation to withstand electrical breakdown due to contamination found in the tether.

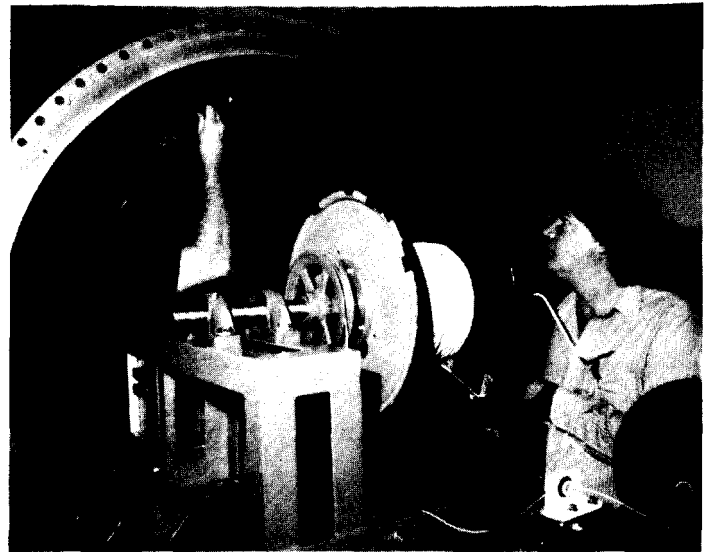
"The tether itself was a remarkable engineering achievement," said Ken Szalai, who chaired the investigative board, "and produced some startling scientific discoveries." Scientific papers recently presented at an American Geophysical Union conference reported that currents generated by the tether were three times higher than theoretical models had predicted prior to the flight.

"Constructing a tether that was strong, lightweight and electrically conducting took the project into technical and engineering areas where they had never been before," said Szalai. "Now, with 20/20 hindsight, they know where the system is vulnerable and can improve the design."

The Tethered Satellite System is a joint NASA-Italian Space Agency (ASI) system that was flown aboard Space Shuttle Columbia in an experiment to better understand the electrically charged environment of Earth's ionosphere, and how tether systems behave in it. ASI had the responsibility of providing the satellite, while NASA had the responsibility of the deployer, which includes the tether, and the overall responsibility for payload integration and operations. The provision of science investigations was shared by ASI and NASA.

The system was generating 3,500 volts DC and up to 0.5 amps of current during satellite deployment. That high level of electrical energy resulted from the length of conducting tether extending from the Shuttle, coupled with the 17,500-mile-per-hour speed at which the Shuttle and tether were cutting through Earth's magnetic field lines.

The board found sufficient evidence to identify two possible causes of the breach in the insulation — foreign object damage, or a defect in the tether itself. Debris and contamination found in the



**Tether Test** — Engineers Jason Vaughn (left) and Toad MacLeod of Materials and Processes Lab and Systems Analysis and Integration Lab, respectively, make preparations for one of many tests Marshall laboratories performed in support of the TSS-IR investigation board. The board's report calls attention to the work of a Marshall "Tiger Team" as one of the sources of "outstanding support" received by the panel. Photo by Emmett Given

deployer mechanisms and in the tether itself could have been pushed into the insulation layer while the tether was still wound on its reel. The investigation found evidence of damage to copper wire in the tether, and also established that normal forces on the tether while on the reel could push a single copperstrand or foreign debris through the insulation.

The arcing, which began in an intricate part of the Tethered Satellite System known as the lower tether control mechanism, sputtered intermittently for nine seconds as the moving tether passed through deployer mechanisms and then into the boom area of the

(See TSS-I R on page 3)



**Roll Tide!**— Beth Guthrie, secretary to the Marshall Centerdirector, greets University of Alabama football Coach and Mrs. Gene Stallings during their tour of the Center last week. Looking on are Deputy Center Director Carolyn Griner and Marshall Personnel Office Deputy Director Danny Hightower (third-from left). Photo by Dennis Olive

# New ISO 9000 Team To Hold Introductory Session

The Marshall team for the Center's newly adopted quality management system, ISO 9000, is holding an introductory session to familiarize the team with the new program. Scheduled for June 10 through 14, the session will review the specific elements of the quality management system with a focus on how to structure the Center's procedures and documentation activities according to ISO 9000 standards.

Marshall recently announced acceptance of this new system which is the International Organization for Standards quality management system.

"ISO 9000 is a proven management system that is internationally recognized and accepted," said Bob Schwinghamer, Marshall's Associate Center Director (Technical) and the ISO 9000 team leader. "Marshall will take advantage of the benefits ISO 9000 has to offer."

ISO 9000 fosters an emphasis on common quality standards which enhances understanding and cooperation between customers

## TSS-1R (from page 2)

tether system. At the time, tether was continuing to play out at one meter per second, or slightly more than three feet per second.

"This arcing produced significant burning of most of the tether material in the area of the arc," the board found. The tether was designed to carry up to 15,000 volts DC and handle tensile forces of up to 400 pounds (1780 newtons). It used super-strong strands of Kevlar as a strength-providing member, wound around the copper and insulation.

However, postflight inspection of the tether end which remained aboard Columbia showed it to be charred. The board concluded that after arcing had burned through most of the Kevlar, the few remaining strands were not enough to withstand forces being exerted by satellite deployment.

Extensive, rigorous tests performed in support of the investigation established that undamaged tether would not arc, even when subjected to electrical potentials much higher than the 3500 volts experienced during the mission.

The board was able to exonerate a number of factors which clearly did not cause the break. These factors include the satellite, the science equipment hardware and operations, which were being conducted prior to the break, in addition to micrometeoroids or orbital debris impact, and electrical storm activity.

The investigation panel made several detailed recommendations which it said should be followed for any future space missions involving electrodynamic tether systems such as that flown aboard Columbia. These include more precautions to ensure any such tether systems in the future do not suffer from possible debris or contamination damage and specific attention during design to minimize the possibility of high-voltage arcing.

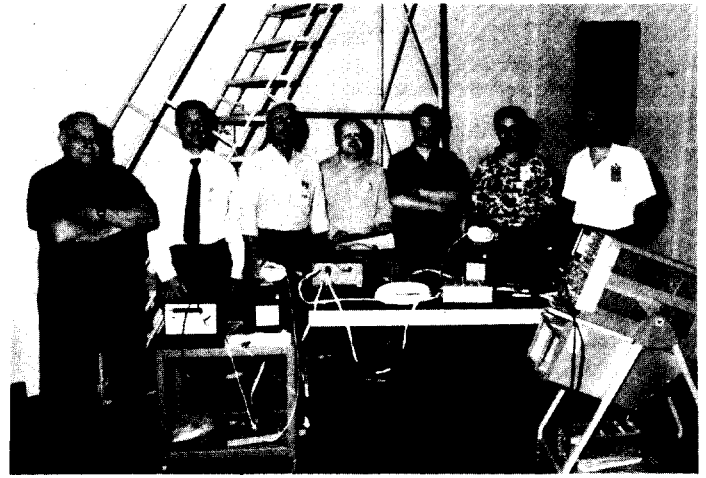
The board offered, in the form of observations, its assessment that the STS-75 tether problem "is not indicative of any fundamental problem in using electrodynamic tethers." It also noted that in spite of the break, a "significant amount" of scientific data was obtained from the Tethered Satellite operations during STS-75.

The nine-member independent review panel was formed in consultation with ASI and appointed by NASA's Associate Administrator for the Office of Space Flight, Wilbur Trafton, shortly after the tether break. The board was chaired by Ken Szalai, director of the Dryden Flight Research Center in Edwards, Calif., and included representation from NASA and (ASI).

and suppliers. ISO 9000 also will be used by Marshall's many international partners. The new system of quality standards will be applied to some existing projects and to all future contracts.

"We intend to use as many existing procedures as possible to minimize the impact to the way we already do business," said Schwinghamer. "But we realize we have several areas that need improvement to meet the requirements of ISO 9000. We expect to consolidate many of our duplicative procedures into one, which will reduce the total numbers of procedures onsite and will work towards NASA's procedure reduction goals."

Marshall's goal is to implement the ISO 9000 system at the Center and with its contractors by mid-1997.



*Station Audio Interface Test -A team of workers from NASA, Boeing and Russia recently completed the international Space Station audio interface test in Marshall's Audio Laboratory. The team ran tests to see how Russian and U.S. audio systems interface for communications aboard the international Space Station. Shown from left are Bill Baker, Boeing-Huntsville; Galen Luckert, Boeing Prime (Houston); Bob Lightcap, Harris Corp.; Porter Clark, Marshall; Viktor Goncharouk, Moscow Scientific Research Institute; Translatortlia Rosenberg; and Igor Tsvetkov, Rocket Space Corp., Energia-Russia.*  
Photo by Dennis Olive

## DC-XA (from page 1)

The flight will be carried live on centerwide television beginning at approximately 8:30 a.m. CDT. An interactive post-flight media briefing will air approximately 30 minutes after the flight.

If an additional test occurs on Friday, it too will be carried live on centerwide television and followed by an interactive media briefing.

## Obituaries

**Carter, Thomas J.**, 89, Huntsville, died May 24. He retired from Marshall in 1972 where he worked in the Materials Laboratory. He is survived by his wife Dixie Carter.

**Daly, Arthur V.**, 77, Huntsville, died May 19. He retired from Marshall in 1974 where he worked in the Facilities Project Office. He is survived by his wife Dorothy Daly.

**Parker, John C.**, 82, Huntsville, died May 23. He retired from Marshall in 1981 where he worked in technical management. He is survived by his wife Margaret Parker.

**Verble, Adas J.**, 68, Huntsville, died May 18. He retired from Marshall in 1981 where he worked as an aerospace engineer. He is survived by his wife Anita Verble.

## Employee Ads

### MISCELLANEOUS

Cannondale Super-V mountain bike, full suspension, all XT components, \$1,350. 883-8738.

Computer memory, 4 MB/8 MB, 72 PIN SIMMS, \$12.50 per megabyte. 776-9118.

Irish currency to exchange for dollars, no commission; electric clothes dryer, \$125; mower, \$60. 881-6040.

Nordic Track Challenger; Kenmore sewing machine with cabinet; antique dining table, 4 chairs. 852-6225.

Craftsman cast iron belt drive 10" table saw, insert and stand, \$295. 536-7075.

Massey Ferguson 35 tractor and bushhog, \$4,300. 498-2813.

Queen size Wooden waterbed, complete with 75% waveless mattress and heater, \$150. 379-3522.

Electric lawnmower; 62-piece Noritake china; director's chair; German mugs; table lamp, men's jewelry. 881-4932.

Sperry PC, 20 M HD, monitor, keyboard, \$40. 881-1785.

Two mountain bikes, \$75. 882-3623.

Ridinglawnmower, 1984 Craftsman, IOHP, 36" cut, \$250. Call 837-9434 after 6 p.m.

### VEHICLES

1992 Mazda Protege DX, 4-door, auto, gray, \$5,400. 233-0726.

1988 MazdaMX-6, red, 5-speed, sunroof, pw, AC, tape, 118K miles, \$4,000. 830-5875.

1987 Ford Aerostar, ps, pb, pw, pl, dual air, am/fm, roof rack, running boards, \$4,700. 586-3061.

1993 Ford Taurus LX, 50K miles, fully equipped, \$8,700. 534-3514.  
Jeep Wrangler 4 X 4, 4.0L, 6-cylinder, 20K miles, two tops, security system. 852-3 133.

1995 Toyota Camry, 4-cylinder, 4-door, maroon, 29K miles, remaining warranty, \$16,500. 722-0439.

1991 Firebird, V8, T-tops, 54k miles, \$7,500. 772-7103.

1989 Audi 80, red, 5-speed, \$6,400. 353-9630.

1993 Saturn SC2, plum, cruise, towable, 5-speed, sunroof, air, 61K miles, \$11,900 negotiable. 498-5520.

1990 Dodge Daytona ES, automatic, 2.5L, spoilers, alloy wheels, AC, air bag, \$3,650 obo, 753-2278.

1989 Acura Legend, \$8,200; 1969 Camaro convertible, \$9,800. 882-3623.

1987 Buick Skyhawk, 2-door, custom, 67K miles, auto, air cruise, \$3,500. 536-5 100.

1978 Winnebago, 24' class C bunkhouse, 440 Dodge, 163" chassis, 15K miles, fully instrumented, roof AC, \$13,900. 539-4574.

### FREE

One year old black Lab mixed, to good home. 574-1650.

### Marshall Star

Marshall Space Flight Center, Alabama 35812

The Marshall Star is published every Wednesday by the Public Affairs Office at the George C. Marshall Space Flight Center, National Aeronautics and Space Administration. Contributions should be submitted no later than Friday noon to the Marshall Public Affairs Office (CA10), Building 4200, Room 108. Submissions should be written legibly and include the originator's name. The Marshall Star does not publish commercial advertising of any kind.

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Director, Media Services - David B. Drachlis  
Director of Public Affairs - John B. Taylor

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## Center Announcements

**HEOS** — The Huntsville Electra-Optical Society will have its annual dinner meeting at 6 p.m. on Friday evening at the Officers Club. Jason Sapan will speak on Holography. Call Helen Cole at 544-6790 for more information and reservations.

**MARS Tennis Club** — The MARS Tennis Club held an Open Mixed Doubles Tournament Saturday. Winners in the "A" division were Hal (CCOI) and Ellen Waggoner. "A" division runners-up were Phil Hays (ED22) and Ronda Moyers (EB35). Winners in the "B" division were Tony (E022) and Sonya Kim. "B" division runners-up were Al Bellingrath (TALL) and Susan Vinz (ED12). The next tournament will be a "Closed Men's Doubles" with three divisions on June 22.

**NARFE** — The National Association of Retired Federal Employees (NARFE), will meet Saturday at the Senior Center on Drake Avenue. NARFE is dedicated to protecting the interests of federal retirees and their dependents. The program will feature the activities of CASA. For more information call 837-0382 or 881-3168.

**Lunch-N-Learn Seminar** — A Lunch-N-Learn Seminar will be held on June 11 from noon until 12:45 in Morris Auditorium. Sherry Lovell, a certified financial planner for Redstone Federal Credit Union will discuss college education and investment planning.

**Mail Handlers** - A federal representative from Mail Handlers will be at the Center on June 13 in Building 4202, Room B- 108 from 8 to 10 a.m.

## CTAP Center Seminars Offered

The Career Transition Assistance Program (CTAP) Center continues to offer seminars for individuals interested in finding jobs, starting a business or retiring. The seminars include:

**Job Search Skills-June 5;** July 9-10; Aug. 13-14; and Sept. 10-11 from 8 a.m. to 4:30 p.m. with a one hour lunch from noon to 1 p.m.

**Networking Intensive Seminar** — June 13 from 8 a.m. - noon, limited to 20 people.

**Small Business Development Counseling** — July 11; Aug. 8; and Sept. 9. Call 544-2400 for available times.

**Retirement Planning** — June 7 from 9 a.m. to noon. This is last seminar offered.

**Women and Investing** — July 11 from 1-3 p.m.

**Lump Sum Distributions** — Aug. 15 from 1-3 p.m.

To register for a seminar, counseling session or for more information about CTAP Center Programs, call 544-2400 or 961-1354.

Ads are published on a space available basis as a personal non-commercial service to Marshall Center employees. Ads must be submitted on Marshall Center form 3332 (dated 1978 or 1983), signed by the advertiser and addressed to CA10. The forms, available in Supply, must be turned in by Friday noon for publication in the next issue.

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